

# ROM III ON Board Monitor

## REPLACING MPP102 WITH ROM III OBM

### Replacement Manual

## IMPORTANT INSTRUCTIONS PERTAINING TO INSTALLATION AND SAFETY



- Hazardous conditions may be present when working with Non-Intrinsically Safe (I.S) voltages. Ensure that power to ROM III is switched off before opening enclosure or removing power lead.**
- Segregate NON-I.S power from I.S signals by running these in separate cables and conduit.
  - Correctly label cables as either 'I.S' or 'NON-I.S'.
  - To prevent the risk of electrostatic sparking, only clean the surface of ROM III with a damp cloth.
  - The ROM III Housing has an M6 External Ground Stud. This Ground Stud is used to connect an APPROVALS REQUIRED #14 AWG (1.5mm<sup>2</sup>) External Ground Wire between the Monitor Housing and Chassis Ground on the tanker. Tighten the Ground Stud Nut to 7.6 N-m.
  - Installation and maintenance shall be carried out in accordance with the applicable code of practice by suitably trained personnel.
  - Associate Apparatus must be installed in accordance with IEC 60079-14 OR National Installation Requirements.



- **DO NOT** connect a battery charger or other pulsed power supply to the ROM III as this may damage it.
- **DO NOT** perform any welding on the tanker when power is applied as this may damage the monitor.

## ROM III APPROVALS

IECEX Certification:		ATEX Certification:	
<b>Certificate:</b>	IECEX FMH 18.0004X	<b>Certificate:</b>	FM18ATEX0015X
<b>Equipment:</b>	ROM III 3308-3308, 3308R-3308, 3308-LIQ, 3308R-LIQ, 3308-SPEC, 3308R-SPEC and 1910A Terminator	<b>Equipment:</b>	Model 3308-3308, 3308R-3308m 3308-LIQ, 3308R-LIQ 3308-SPEC, 3308R-SPEC ROM III Monitor and Model 1910 ROM Terminator
<b>Markings:</b>	Ex nA [ia Ga] IIB T4 Gc	<b>Markings:</b>	II 3(1) G Ex nA [ia Ga] IIB T4 Gc Ta= -40°C to 70°C
<b>Standards:</b>	IEC 60079-0: 2017 IEC 60079-11: 2011 IEC 60079-15: 2010	<b>Standards:</b>	EN IEC 60079-0: 2018 EN IEC 60079-11: 2012 EN IEC 60079-15: 2010

Terminal TB1-2 Vmax (Um): 30Vdc Terminal TB1-3 (relay-GND) limited to 30V DC, 5A max

### ENTITY PARAMETERS FOR TERMINAL BLOCK TB2

TERMINALS	Po	Uo(Voc)	Io(Isc)	Co(Ca)	Lo(La)
TOP SENSORS: 1,2,3,4,5,7 or 8 TO COM (GND)	110mW	11.8 V	36.2mA	400nF	3.8mH
BOTTOM SENSORS: 1,2,3,4,5,7 or 8 TO COM (GND)	110mW	11.8 V	36.2mA	400nF	3.8mH
TOP SENSORS: 1,2,3,4,5,7,8 IN PARALLEL TO COM (GND)	0.546W	11.8 V	185mA	400nF	3.8mH
BOTTOM SENSORS: 1,2,3,4,5,7,8 IN PARALLEL TO COM (GND)	0.546W	11.8 V	185mA	400nF	3.8mH

### ENTITY PARAMETERS FOR TERMINAL BLOCK TB3

TERMINALS	Pi	Ui	Ii	Ci	Li
FLOAT 1	1.0W	20.0V	750mA	0nF	0mH
FLOAT 2	1.0W	20.0V	750mA	0nF	0mH
THERM ORG	1.0W	20.0V	750mA	0nF	0mH
THERM RED	1.0W	20.0V	750mA	0nF	0mH
OPTIC PWR RED	1.0W	20.0V	750mA	0nF	0mH
OPTIC PULSE IN ORG	1.0W	20.0V	750mA	0nF	0mH
OPTIC PULSE OUT YEL	1.0W	20.0V	750mA	0nF	0mH

### ENTITY PARAMETERS FOR TERMINAL BLOCK TB4

TERMINALS	Po	Uo(Voc)	Io(Isc)	Co(Ca)	Lo(La)
AUX 1,2 or 3 COM (GND)	19mW	30V	2.5mA	400nF	1.9H
AUX 1,2,3 IN PARALLEL TO COM (GND)	0.546W	30V	7.5mA	400nF	1.9H
		Ui	Ii	Ci	Li
AUX OUT TO COM (GND)		20V	50mA	0nF	0mH

## LIQUIP PART NUMBERS:

- LIQ3308-LIQ: ROM III OBM  
 LIQ1910A: ROM terminator probe  
 LIQ3308-LIQZ: Kit comprises of ROM III OBM + 1910A terminator

## FEATURES AND SPECIFICATIONS FOR ROM III and MPP102

	ROM III (LIQ3308-LIQ)	MPP102
<b>Monitoring mode</b>	<ul style="list-style-type: none"> <li>Up to 8x2-wire optic overfill probes (TOP)</li> <li>Earth assurance only (combined with DP300)</li> </ul> <p><i>Connect terminator probe (LIQ1910A) to unused channels</i></p>	<ul style="list-style-type: none"> <li>1x2-wire optic probe (TOP) only, OR</li> <li>1x2-wire fibre probe (TOP) only, OR</li> <li>1x2-wire optic + 1x2-wire fibre (TOP), OR</li> <li>Earth assurance only (combined with DP300)</li> </ul>
<b>Application</b>	<ul style="list-style-type: none"> <li><b>Standalone - no connection to rack monitor.</b> <i>ROM III uses its non-IS relay to enable/disable product transfer based on PERMISSIVE state.</i></li> <li><b>Connection to rack monitor via truck plug</b> <i>ROM III provides I.S probe signals to truck plug based on PERMISSIVE state. Rack monitor connects to truck plug and enables/disables transfer based on the PERMISSIVE state indicated by ROM III.</i></li> </ul>	<ul style="list-style-type: none"> <li><b>Standalone - no connection to rack monitor.</b> <i>MPP102 uses the non-IS relay to enable/disable product transfer based on PERMISSIVE state.</i></li> <li><b>Connection to rack monitor via truck plug</b> <i>MPP102 provides I.S probe signals to truck plug based on PERMISSIVE state. Rack monitor connects to truck plug and enables/disables transfer based on the PERMISSIVE state indicated by MPP102</i></li> </ul>
<b>OBM - Rack Monitor Interface</b>	<ul style="list-style-type: none"> <li>Simulated 5-wire optic probe, OR</li> <li>Simulated 2x2-wire optic probes</li> </ul>	<ul style="list-style-type: none"> <li>Simulated 2x2-wire optic probes</li> </ul>
<b>NON-I.S Relay</b>	<ul style="list-style-type: none"> <li>Voltage free, Normally Open-COM I</li> <li>Switches up to 30VDC @ 5A max</li> </ul>	<ul style="list-style-type: none"> <li>Voltage free Normally Open or Normally Closed</li> <li>Switches up to 30VDC @ 5A max</li> </ul>
<b>I.S (AUX) Inputs</b>	<ul style="list-style-type: none"> <li>I.S voltages output on AUX1, AUX2, AUX3 <math>U_o=11.8V</math>, <math>I_o&lt;2.5mA</math> on each channel. <i>Each connects to a switch or is hard wired to COM. PERMISSIVE is only given if all AUX inputs are connected to COM and there is no overfill state</i></li> </ul>	NOT SUPPORTED
<b>I.S Relay</b>	<ul style="list-style-type: none"> <li>I.S voltage inputs to AUX OUT <math>U_i=20V</math>, <math>I_i=50mA</math> <i>Voltage free open-collector output. Switches to ground when monitor gives PERMISSIVE</i></li> </ul>	NOT SUPPORTED
<b>Input Voltage</b>	<ul style="list-style-type: none"> <li>9VDC to 30VDC</li> </ul>	<ul style="list-style-type: none"> <li>11.5VDC to 30VDC</li> </ul>
<b>Input Voltage Fuse</b>	<ul style="list-style-type: none"> <li>Max. 0.5A, slow blow, located in safe zone</li> </ul>	<ul style="list-style-type: none"> <li>Max. 5A, slow blow, located in a safe zone</li> </ul>
<b>Ambient Temperature</b>	<ul style="list-style-type: none"> <li>-40°C to +70°C</li> </ul>	<ul style="list-style-type: none"> <li>-25°C to +60°C</li> </ul>
<b>Approved Location</b>	<ul style="list-style-type: none"> <li>Zone 2 or non-hazardous area</li> </ul>	<ul style="list-style-type: none"> <li>Zone1, Zone 2 or non-hazardous area</li> </ul>
<b>Approved Atmosphere</b>	<ul style="list-style-type: none"> <li>Group IIB and Group IIA</li> </ul>	<ul style="list-style-type: none"> <li>Group IIA</li> </ul>
<b>Ingress Protection</b>	<ul style="list-style-type: none"> <li>IP54</li> </ul>	<ul style="list-style-type: none"> <li>IP66</li> </ul>
<b>Dimensions</b>	<ul style="list-style-type: none"> <li>184.2mm x 127mm x 60mm</li> </ul>	<ul style="list-style-type: none"> <li>146mm x 120mm x 62mm</li> </ul>

## INTRODUCTION

This document explains how the ROM III On-Board -Monitor (OBM) when used in conjunction with terminator probe LIQ1910A, can replace the Liquip MPP102 OBM for:

- Fuel overfill monitoring in a single compartment road tanker, or storage tank.
- Dedicated earth assurance device for use at a terminal.

A complete discussion of all ROM III features can be found in the '**ROM III Overfill Detection and Retain Product Monitor, Installation and Operations Manual**' (H53265PAL).

## INSTALLATION INSTRUCTIONS

### Mounting Location

When replacing an MPP102 with a ROM III (LIQ3308-LIQ) it may necessary to modify cable routing to ensure the ROM III is located within an approved area.

ROM III is approved for installation in Zone2, IIB (Tamb=-40°C to +70°C) hazardous area, or safe area

Refer to IEC 60079-10-1 for zone definitions relevant to storage tank applications.

At the time of writing, road tankers in Australia carrying flammable liquids or compressed gases must comply with AS2809-2008, as follows:

*'The following hazardous areas shall be deemed to exist at all times:*

- (a) Within 500 mm of any point of product release shall be Class 1, Zone 1.*
- (b) Rear of the cabin and 8 metres radially from any uncapped valve or transfer connection from ground level to a height of 500 mm shall be Zone 2'*

### Mounting the Enclosure

New mounting holes will need to be drilled when replacing a MPP102 with a ROM III - refer to fig1. The ROM III enclosure has four 7/16" mounting holes. Use 8mm bolts to secure the enclosure to a metal chassis or structure.

### Wiring Installation

#### Cabling System

Terminals on ROM III can accommodate 14-20 AWG (0.5-2.5mm<sup>2</sup>) gauge wires, or 16-20 AWG (0.5-1.5mm<sup>2</sup>) if ferrules are used. Wiring for MPP102 system can generally be reused for the ROM III.

For new installations, run cables inside a conduit system to provide best protection against mechanical and environmental stress. Use cables resistant to moisture, petrochemicals and UV. At minimum, I.S cables should have a tough outer sheathing and be clearly labelled 'I.S'.

Cables used in a MPP102 system are typically run through M16 conduit. To ensure compatibility when retrofitting a ROM III, first insert ½" NPT to M16 adapters into ROM III cable entries, and then insert M16 conduit glands with strain relief. If instead cable glands are used, amalgamation tape can be employed to seal the conduit - gland interface to the minimum required IP54 rating. Unused cable entries must have blanking plugs inserted.

There is only one NPT hole provided at the top left side of the monitor to bring NON-IS power and relay signal into the enclosure (see figure 1). The remaining six NPT holes must only be used for I.S signals and as shown in figure 1. This convention must be followed.

## Housing External Ground Stud

The ROM III has an external M6 Ground Stud (see Figure 1) which is used to connect an **APPROVALS REQUIRED** #14AWG (1.5mm) External Ground Wire between the Monitor Housing and the Chassis Ground on the tanker. It is suggested that this wire have a Green (or Green with Yellow strip) for proper identification as a “chassis ground” connection. Tighten the Ground Stud Nut to 7.6 N-m.

## Power and Relay

The ROM III can use the same power supply as that used for the MPP102 (11.5-30Vdc). However, the 5A slow blow fuse recommended for MPP102 must be replaced with a 0.5A maximum slow blow fuse (see Fig 4).

It’s also recommended that a switch is placed in-line with the voltage input to the ROM III so it can be powered off when not used (see Fig4). **This switch must be in a non-hazardous area.**

In Australia, ROM III installed on road tankers carrying explosive fuels must be powered from the secondary side of a battery isolation switch (BIS). This is a mandatory requirement of AS2809-2008.

Both MPP102 and ROM III are equipped with a NON-I.S relay (30Vdc, 5A) which for switching a solenoid valve or contactor. The ROM III relay is normally open (**NO**) and switches to **0V(GND)** when PERMISSIVE (ie. current sinking). Conversely, MPP102 has **NO/NC/COM** floating relay contacts. When **COM** terminal is connected to **0V(GND)**, the **NO** relay behaves identically to the ROM III.

For an MPP102, the power supply (**V+**, **0V**) and NON-IS relay signal (**NO**, **COM**) are contained within a single cable. When retrofitting a ROM III, disconnect the cable (carrying power + relay) from the MPP102 and pass it through the top left cable entry of the ROM III enclosure only (see Fig1).

Connect the **V+** wire to the **+12/24V** terminal (TB1) of ROM III. Either cover **COM** with heatshrink, or join the **0V** and **COM** wires together and insert into the **GND** terminal (TB1). The relay control signal for the MPP102 (**NO**) can be wired into the **RELAY-** terminal (TB1) of the ROM III.

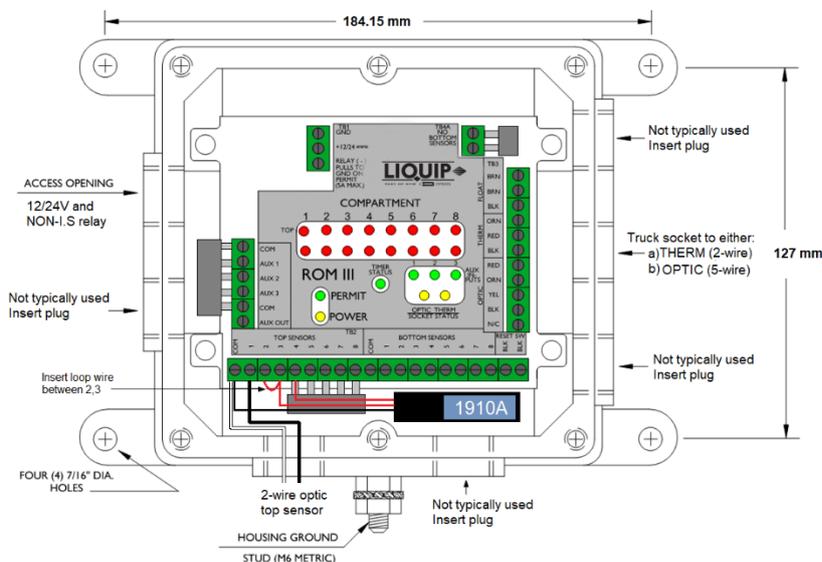


Figure 1

## Configuring the ROM III for Overfill Monitoring (only)

1. To DISABLE bottom sensor monitoring, insert a link strip at TB4A (Fig1).
2. **AUX 1, AUX 2, AUX 3** are I.S signal sources. These inputs are not required for MPP102 type applications and must be connected to **COM** terminal using a 5-way strip inserted into TB4B.  
*Note: COM terminal is internally connected to GND terminal.*
3. The I.S relay terminal labelled '**AUX OUT**' can remain unconnected.
4. Place the LIQ1910A terminator probe inside the ROM III enclosure alongside bottom sensor terminals (TB2) as shown in Fig1.
5. Insert 5-way strip supplied with 1910A terminator into top sensor terminals 4,5,6,7,8.
6. Insert the black lead of the LIQ1910A to top sensor **COM** terminal.
7. Connect one red lead of the 1910A to top sensor terminal#3. Use a piece of insulated wire to loop terminals 2,3. Connect the other red lead to terminal#4.

## Connecting Probe Sensors

ROM III is incompatible with fibre-optic probes. If a fibre-optic probe is used on a MPP102 then this must be replaced with a 2-wire optic probe (eg LDP202) when replacing with a ROM III.

In the case of the MPP102, the 2-wire optic probe is connected to an extension cable inside a junction box. This cable runs back to the MPP102 and connects at the (**WHT, BLK**) terminals (Fig2a).

To migrate the 2-wire optic probe from MPP102 to the ROM III, disconnect the wires at (**WHT, BLK**) terminal on the MPP102 and connect it to the ROM III at TB2 as follows:

- The wire previously connected to **WHT** terminal shall be connected to **COM** at (TB2)
- The wire previously connected to **BLK** terminal shall be connected to **TOP SENSOR1** at (TB2)

## Connecting ROM III to a Rack Monitor

Figure 2a shows the wiring scheme used when the MPP102 is connected to a 2-wire rack monitor via a truck socket. The 2-wire sensor, socket and MPP102 are connected inside a junction box.

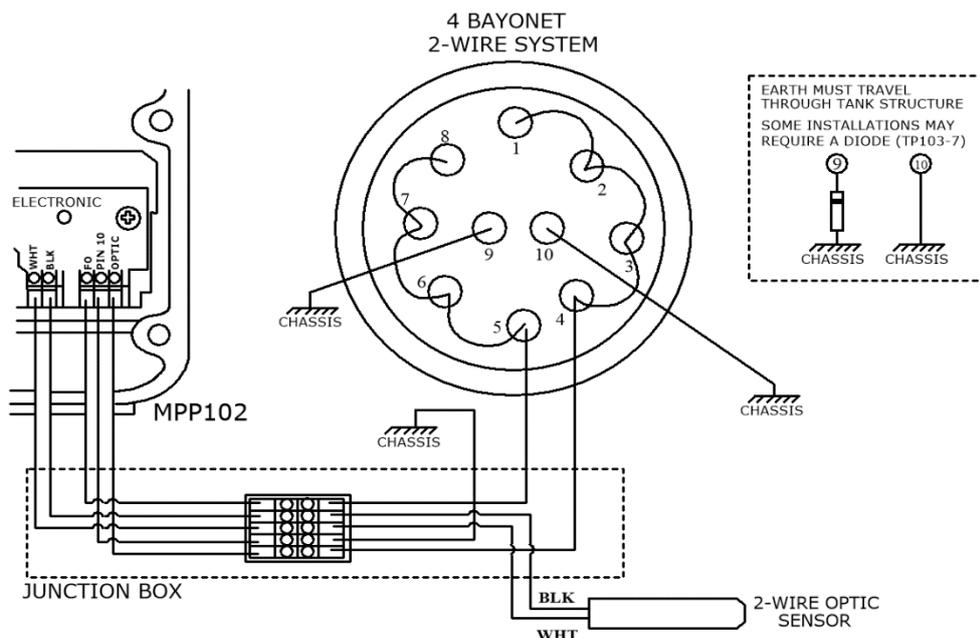


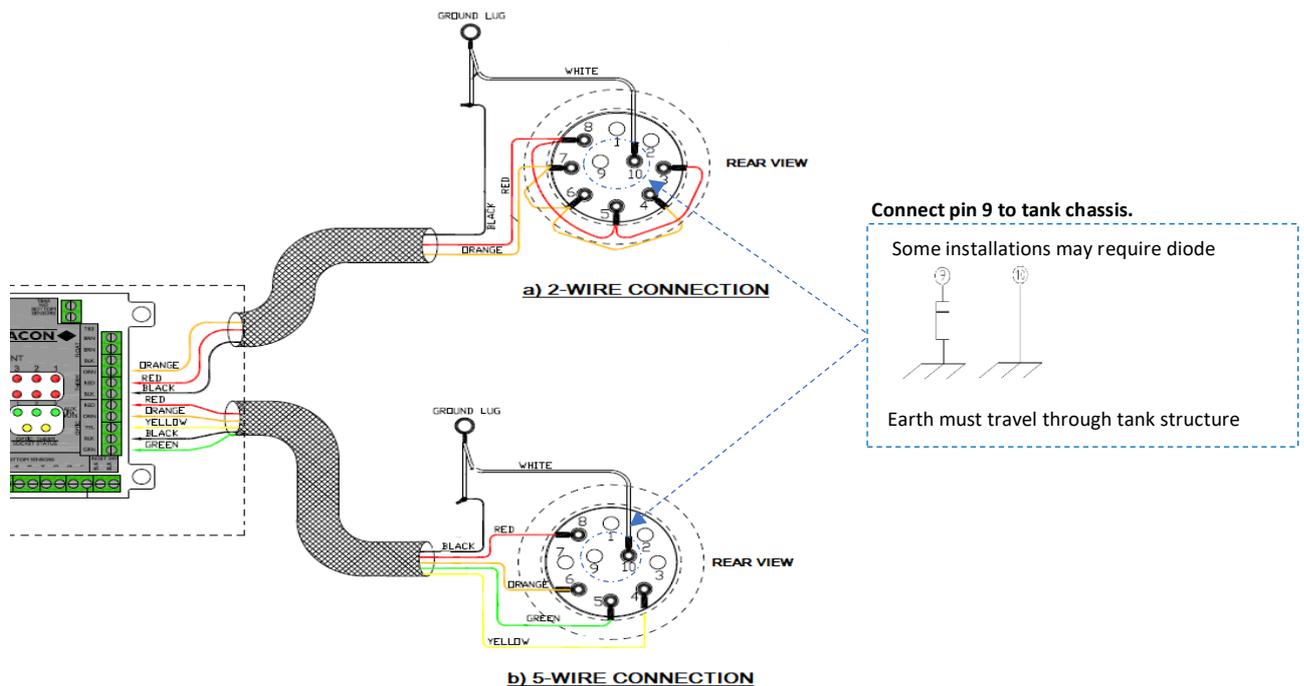
Figure 2a. MPP102 2-wire socket wiring

The truck socket wiring arrangement in Figure 2a can be retained when replacing an existing MPP102 with a ROM III. Connect the ROM III to the truck socket as follows:

- Disconnect the wires inserted in the 'FO' and 'OPTIC' terminals of the MPP102 and connect these to the terminals labelled 'ORN' and 'RED' at THERM/TB3 of the ROM III, respectively.
- Disconnect the wire connected to 'PIN 10' terminal of the MPP102 and connect it to the terminal labelled 'BLK' at THERM/TB3.

The recommended truck socket wiring for a new ROM III installation is shown in Figure 2b. Note that Pins 1, 2 on the truck socket are not generally used in Australia and can be left disconnected.

Figure 2b also shows wiring for a 5-wire rack monitor interface. The colours shown for the 5-wire interface are typical. The 2-wire interface is more common in Australia and is the simplest option when replacing MPP102 with ROM III. Nonetheless either option can be used, but only one wiring scheme can be implemented.



**Figure 2b.** ROM III socket wiring (2-wire and 5-wire options)

## POWER-ON TEST

After completing all wiring, secure the lid of the ROM III using the bolts provided.

Apply power to the ROM III. For a dry working probe, you should observe the following:

- The LED labelled Power is orange provided supply > 10V, otherwise it is OFF.
- The LED labelled PERMIT is green.
- All LED (1-8) labelled TOP are OFF.
- The three LED labelled AUX-INPUTS are green.
- The LED labelled THERM is orange if connected to a rack monitor, otherwise it is OFF.

If the 2-wire probe is wetted or disconnected from the ROM III (at a junction box) then:

- The LED labelled PERMIT is OFF
- The LED labelled TOP 1 is red, indicating the 1<sup>st</sup> probe is wet or faulty.
- All other LED should be unchanged.

## USING ROM III AS A EARTH ASSURANCE MONITOR

With the addition of a dummy probe, like the Liquip DP250 or DP30X, the MPP102 can be wired to function as a dedicated earth assurance monitor for use at a gantry. The setup is shown in Figure 3.

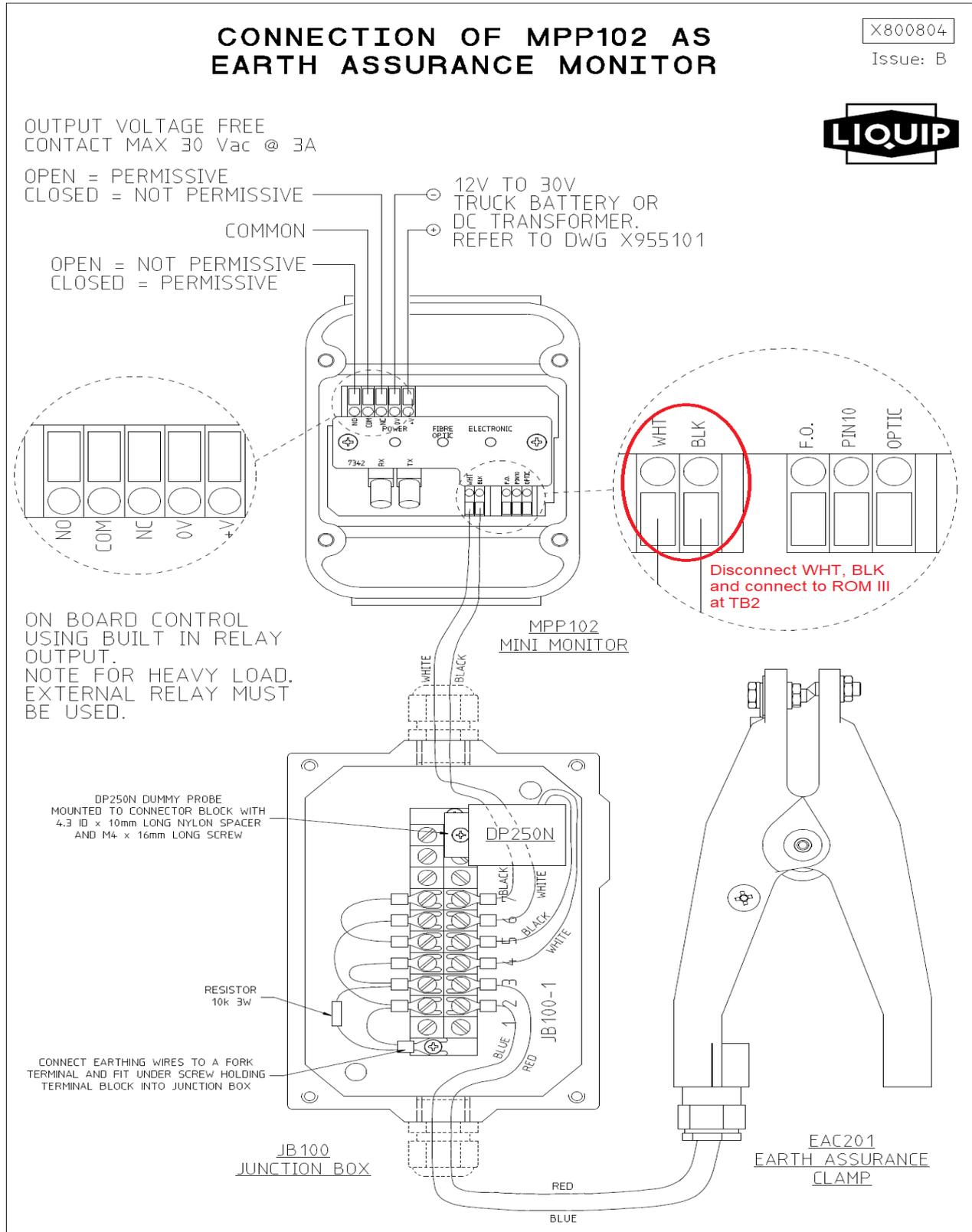


Figure 3. MPP102 configuration for earth assurance

When replacing a MPP102 with a ROM III for the earth assurance setup shown in Figure 3, perform the following steps:

1. Turn off power to MPP102.
2. Secure the ROM III to a metal structure bonded to the terminal safety earth via a low resistance connection ( $< 10\Omega$ ).
3. Connect a #14 AWG (1.5mm<sup>2</sup>) External Ground Wire between the monitor's M6 Ground Stud and the metal structure to which it is secured. Tighten the Stud Nut to 7.6 N-m
4. Use a multimeter to check that resistance between ROM III **GND** and terminal earth is  $< 10\Omega$ .
5. Disconnect power wires at **(+V, 0V)** terminals of MPP102.
6. Remove the lid of the ROM III.
7. Connect the power wires to **+12V/24V** and **GND** terminals at TB1 of the ROM III.
8. Insert termination links into TB2, TB4A and TB4B as previously discussed in the section '*Configuring the ROM III for Overfill Monitoring only*'
9. Insert 1910A terminator probe as discussed in '*Configuring the ROM III for Overfill Monitoring only*'
10. Disconnect wire at **WHT** terminal of MPP102 and connect to **COM (GND)** at TB2 on ROM III
11. Disconnect wire at **BLK** terminal of MPP102 and connect to **TOP SENSOR 1** at TB2 on ROM III

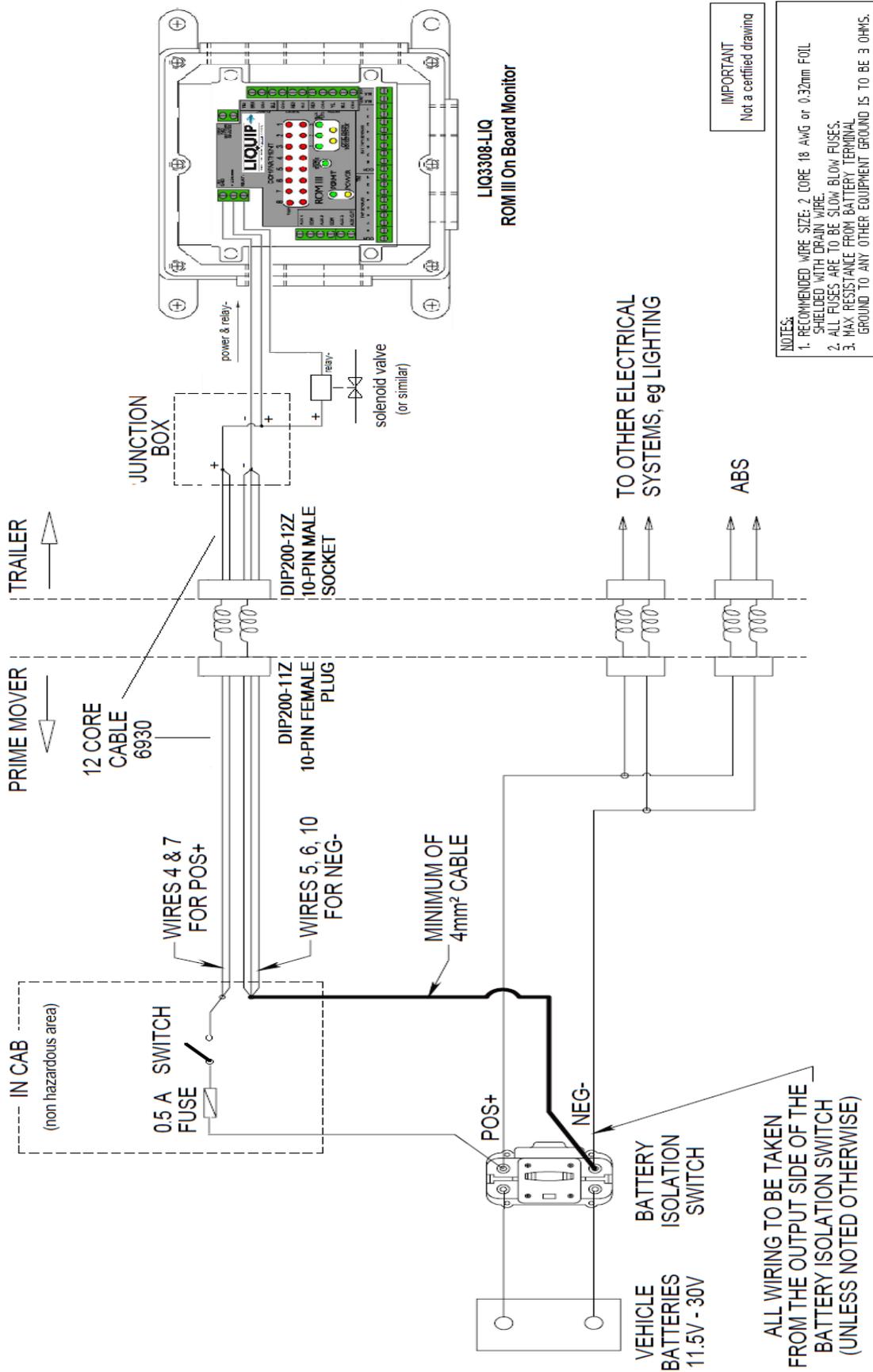
#### EARTH ASSURANCE OPERATION

- Apply power to the ROM III and connect the EAC2xx clamp to the vehicle.
- If the contact resistance between the clamp and truck exceeds approximately  $200\Omega$ , then ROM III will give NON-PERMISSIVE; the PERMIT led will be off and the Relay will be open.
- If the PERMIT led is green then the vehicle is earthed, and the NON-I.S Relay will be closed.

Note: If a DP30X dummy probe is used instead of the DP250, the  $200\Omega$  resistance value stated above will change to approximately  $250\Omega$ .

Figure 4. ROM III Power System for ROM III mounted on a trailer

POWER WIRING FOR STANDALONE ROM III LOCATED ON A TRAILER



## Document History

DATE	ISSUE	DETAILS
19/8/2019	A	Original issue